DR-26. MOLECULAR DESIGN OF NEW HYBRID SYSTEMS BASED ON FULLERENES AND NORBORNADIENES

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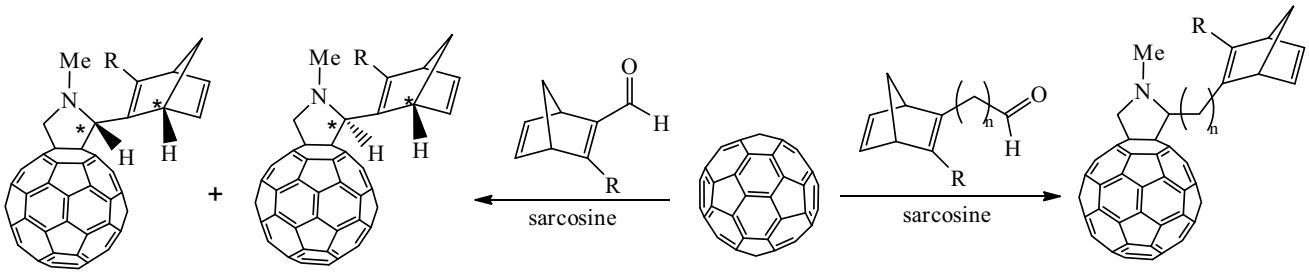
The report discusses the original research of the authors aimed at developing a new class of hybrid molecules based on fullerenes and norbornadiene-quadricyclane molecular systems, promising for conversion and storage of solar energy, as well as for medicine.

Considering the huge interest of researchers in organic photovoltaics, because of significant shortcomings of existing inorganic solar batteries, the authors put forward the idea of creating fundamentally new materials for modern organic batteries and solar energy converters using both chemically strained structures and photoinduced electron transfer between a donor and acceptor.

To realize this idea, the chemical bonding between fullerene C_{60} and norbornadiene has been carried out under the Prato reaction conditions to produce new hybrid molecules that combine the properties of the original carbon cluster as *n*-type semiconductor and the ability of norbornadiene to undergo transformation to energetically strained quadricyclane under visible light irradiation.

It was found, that the cycloaddition between the fullerene C_{60} and norbornadienes, in which the aldehyde group is directly linked to the polycyclic fragment, in the presence of sarcosine, under the reaction conditions (80 °C, 2 h, *ortho*-xylene), resulted in a mixture of diastereoisomeric pyrrolidinofullerenes **1, 2 a** and **1, 2 b** in 68 % total yield and 1 : 1 molar ratio, due to the presence of two chiral centres in hybrid molecules **1** and **2**.

With increasing distance between the aldehyde group and C_{60} molecule by a given number *n* of CH_2 groups, the diastereomeric effect in pyrrolidinofullerenes **3–8** decreases and, therefore, only one set of signals is observed in the NMR spectra.



1,2 a **1,2 b** **3-8**

1: R= Am
2: R= Ph

3: R= Am, n=1; **4:** R= Am, n=2; **5:** R= Am, n=3;
6: R= Ph, n=1; **7:** R= Ph, n=2; **8:** R= Ph, n=3

Currently the photochemical intramolecular rearrangement of norbornadiene to quadricyclane in the synthesized hybrid molecules under ultraviolet (UV) irradiation (260 and 340 nm) is being studied.

This work was fulfilled within the budget topic (AAAA-A17-117012610065-2), and financially supported by Russian Foundation for Basic Research (Project № 17-03-00120).